

311/01

BIOLOGY

MODULE BI1

A.M. THURSDAY, 8 January 2004

(1 hour 30 minutes)

For Examiner's Use Only

Total Marks	
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Centre Number

Candidate's Name (in full)

Candidate's Examination Number

INSTRUCTIONS TO CANDIDATES

Write your centre number, name and candidate number in the spaces provided above.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. Below is a list of chemicals which may be found in cells.

A	Pentose	F	Amino acid
B	Glycerol	G	Glucose
C	Sucrose	H	Glycogen
D	Calcium	I	Cellulose
E	Water		

Each of the following statements applies to one or more of these chemicals.

After each statement, write in the box the letter or letters which correspond(s) to the chemical(s) being described. Each letter may be used once, more than once, or not at all.

(a) The carbohydrate in plant cell walls.

(b) The carbohydrate in nucleic acids.

(c) Contains acidic and basic groups.

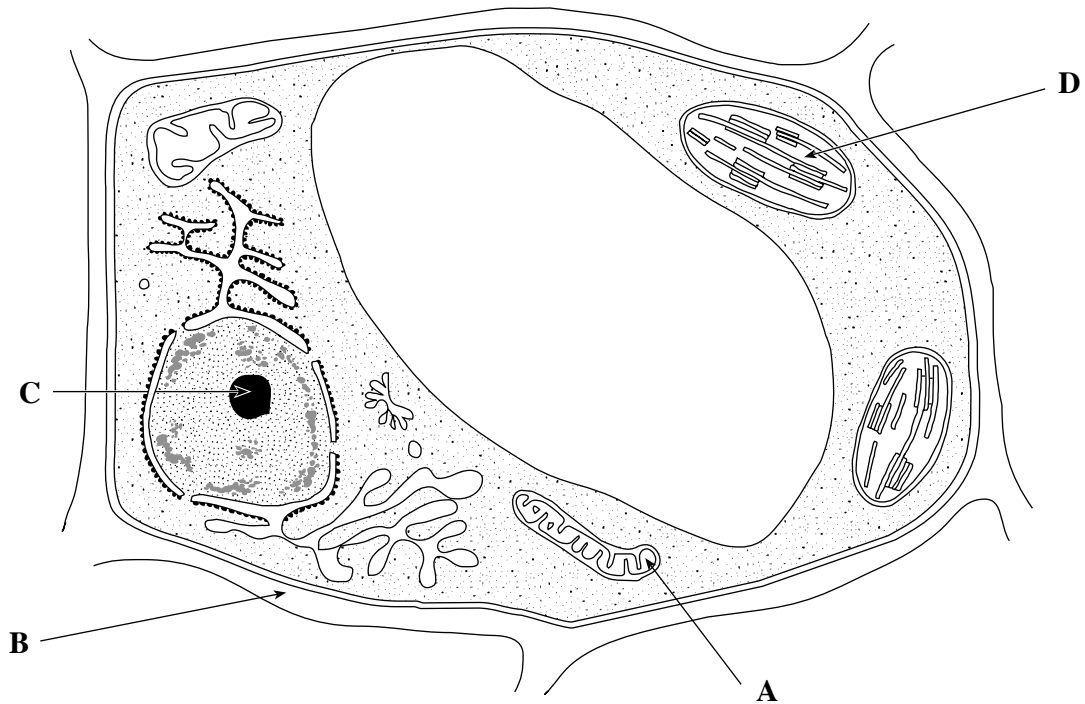
(d) The most abundant inorganic component of cells.

(e) A common polymer in liver cells.

(f) Can form part of a helix.

(Total 7 marks)

2. The diagram below shows a plant cell. Name the organelles labelled **A** to **D** and for each indicate its main function.



A Name

Function

[2]

B Name

Function

[2]

C Name

Function

[2]

D Name

Function

[2]

(Total 8 marks)

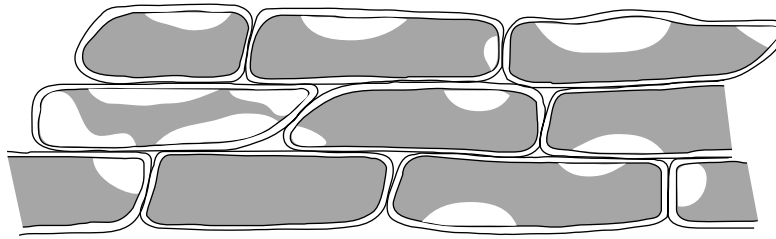
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3. Different compounds are transported through the plasma membrane into the cell in different ways. Complete the table below to show how the three types of compound in the first column enter the cell. In the last column list one factor which could alter the rate of entry of the compound at constant temperature.

<i>Type of compound</i>	<i>Mode of transport into cell</i>	<i>Component of the membrane through which it passes</i>	<i>Factor affecting rate of transport</i>
Lipid soluble			
Water soluble in high external concentration			
Water soluble in very low external concentration			

(Total 9 marks)

4. The diagram below shows some plant cells as seen through a microscope.



Water relationships in the cell are related by the following equation

$$\Psi_{\text{cell}} = \Psi_s + \Psi_p$$

where Ψ_s is the solute potential and Ψ_p is the pressure potential.

- (a) On the diagram label:

A – a plasmolysed cell;

B – a turgid cell.

[2]

- (b) (i) What proportion of the cells would be plasmolysed when their mean Ψ_s equals the water potential of the external solution? [1]

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- (ii) What is the name given to this situation? [1]

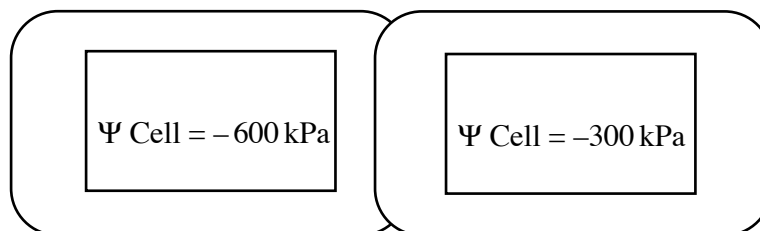
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- (c) A plant cell has a water potential of -600 kPa and a solute potential of -950 kPa. Calculate the pressure potential of this cell. [1]

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- (d) (i) Draw an arrow to show the overall direction of water movement between the two cells below. [1]



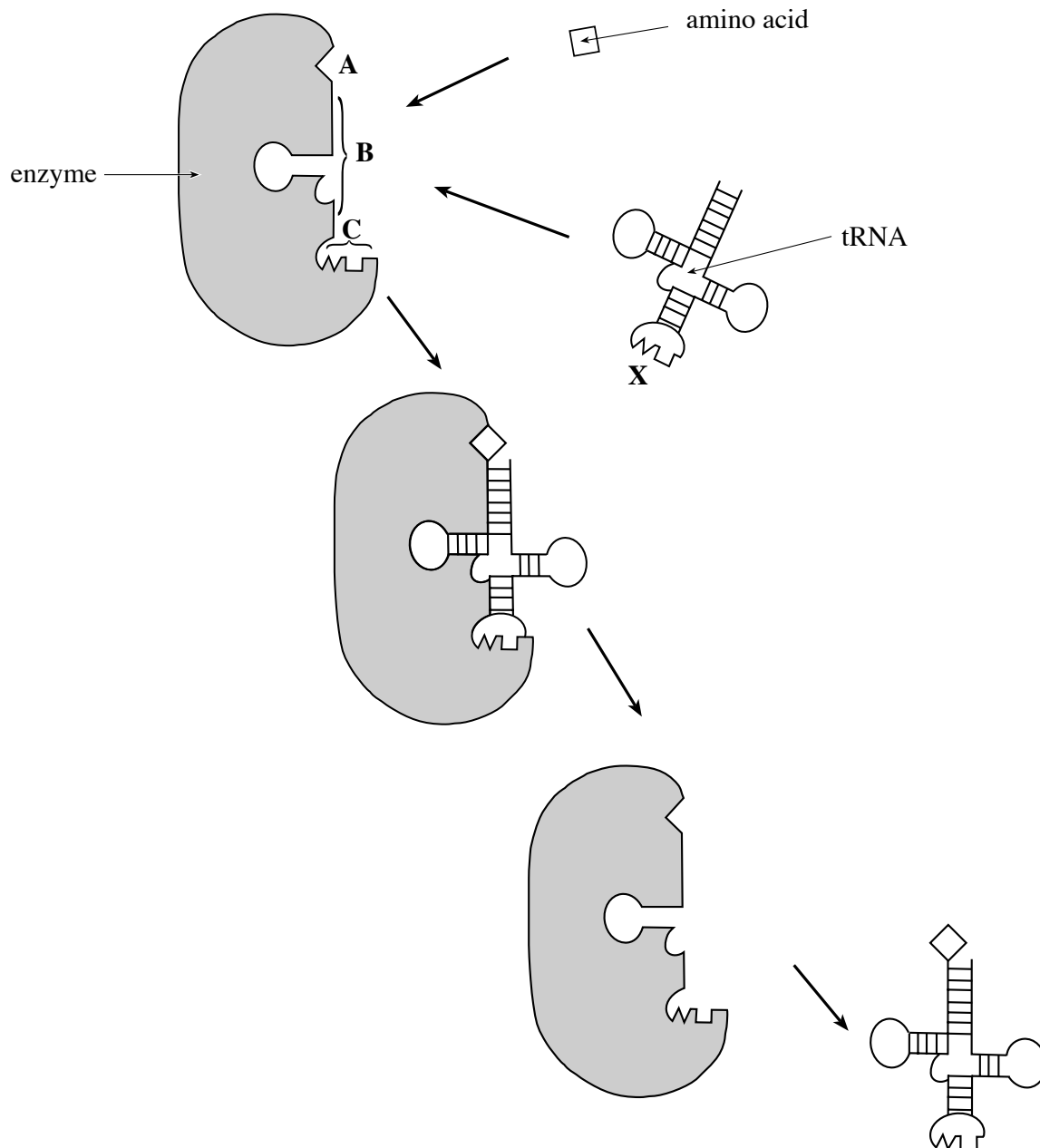
- (ii) Calculate the water potential of the two cells at equilibrium. [1]

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(Total 7 marks)

Turn over.

5. During protein synthesis, amino acids are carried by tRNA. Each amino acid is first joined to its tRNA by an enzyme. The diagram below shows the stages in this process.



(a) What is the name given to the region consisting of **ABC**?

[1]

(b) State the theory which describes how an enzyme combines with a specific substrate.

[1]

- (c) The shape of the enzyme molecule partly depends upon different types of bond. Name **two** of these bonds. [2]

.....
.....

Each amino acid will combine with only one enzyme.

- (d) Using a letter from the diagram state which region of the enzyme is responsible for this specificity. [1]

.....

- (e) Apart from the enzyme, one other molecule is needed to activate the joining of the amino acid and tRNA. Name this molecule, which is not shown in the diagram. [1]

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- (f) (i) Name the region labelled **X** in the diagram. [1]

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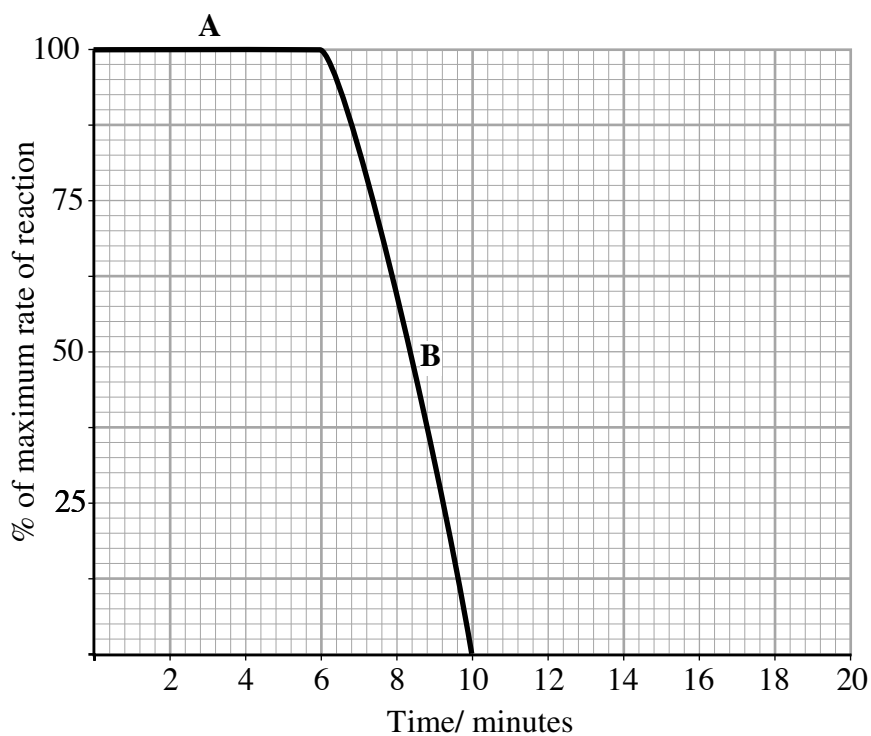
- (ii) Explain the importance of region **X** in protein synthesis. [1]

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(Total 8 marks)

6. An enzyme extract was added to a known concentration of substrate and the rate of reaction monitored every two minutes over a twenty-minute period. The results are shown on the graph below.



- (a) State **two** factors that need to be controlled in order to obtain reliable results. [2]

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.....

- (b) (i) Explain why the region labelled **A** on the graph is horizontal. [1]

.....

.....

- (ii) Explain the shape of region **B**. [1]

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.....

- (c) The experiment was repeated but the enzyme extract was diluted to half its original strength. Draw accurately on the above graph the results you would expect to see. [3]

- (d) (i) Explain what is meant by the term immobilised enzyme. [1]

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- (ii) Give **two** advantages of using immobilised enzymes in industry. [2]

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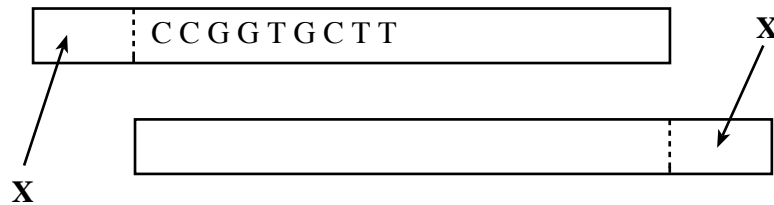
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- (iii) Give **one** use of immobilised enzymes in industry or medicine. [1]

.....

(Total 11 marks)

7. The diagram below represents part of a piece of DNA which was used to introduce a gene into a bacterial plasmid.



- (a) Name the type of enzyme that was used to:

- (i) remove this DNA from the donor;

[1]

.....

- (ii) join this DNA into the plasmid.

[1]

.....

- (b) (i) Name the regions labelled X.

[1]

.....

- (ii) What is the role of these regions?

[1]

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The following is a list of mRNA codons and the amino acids for which they code.

GGC – Glycine

UCC – Serine

CCA – Proline

CUC – Leucine

GAA – Glutamine

GCC – Alanine

CAC – Histidine

ACG – Threonine

CGG – Arginine

- (c) (i) The upper strand of the inserted DNA shown in the diagram was used in the synthesis of a polypeptide. Name the first **two** amino acids in this polypeptide. [2]

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.....

- (ii) Name the organic base represented by the letter G.

[1]

.....

- (d) (i) Give an example of where a human gene is introduced into a bacterial plasmid for medical use. [1]

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- (ii) Give **two** advantages of this technology. [2]

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(Total 10 marks)

- 8.** Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, (a) Describe the changes that take place in an animal cell during meiosis I. (Details of meiosis II are not required.)

[10]

Or (b) Describe the structure and function of the rough endoplasmic reticulum, golgi and lysosomes. [10]

[10]

[illegible]

(0006/11)

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